**EARTH CHEMISTRY**

LAB REPORT – 80 pts.

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Group #: \_\_\_\_\_\_\_\_

Period: \_\_\_\_\_\_\_\_

**OBJECTIVE:** To differentiate between physical and chemical properties and changes.

**QUESTION:** How can you distinguish between the physical/chemical properties of two compounds?

**HYPOTHESIS:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ **(1 pt.)**

**MATERIALS:**

* Compound A
* Compound B
* 2 - 125 mL. Erlenmeyer flasks
* Balance scale
* Petri dish
* Plastic spoon
* Calculator
* Vinegar
* Funnel spout
* Graduated cylinder
* Plastic pipet
* Safety glasses
* Lab apron
* 1 lab report sheet per student

**INTRODUCTION:**

**Matter** is anything taking up space and having mass. **Mass** is the amount of matter in an object. The three main states of matter include solid, liquid and gas although a fourth state known as plasma may exist. All matter has two types of distinguishing characteristics, or properties: **physical** and **chemical**. Physical properties can be observed without changing the chemical composition of a substance. Chemical properties describe how a substance reacts with another substance. About 90 elements occur naturally on Earth and elements consist of **atoms**, which are the smallest units of an element having the chemical properties of that element. Three main types of subatomic particles include **protons** (positive charge in the nucleus), **neutrons** (neutral or no charge in the nucleus), and **electrons** (negative charge surrounding the nucleus in a region known as the electron cloud consisting of energy levels, or shells). The **Periodic Table of Elements** is a system for classifying elements and was first devised by the Russian chemist, Dmitri Mendeleev, in 1869. Rows on this table are called **periods** and columns are called **groups**.

**PROCEDURE:**

1. Make sure all lab ware is clean by rinsing out thoroughly with one small drop of soap and water using the brushes at your lab sink.
2. Take your Petri dish to the center lab station where the compounds (A and B) are present. Using the balance scale, retrieve 4 g. of compound A and place into your Petri dish. In order to get an accurate measurement of 4 g, you will need to first place your Petri dish on the balance scale and “tare” to 0. Make sure the units on the balance scale read grams (g). Then, place compound A in your Petri dish until you have a total of 4 g. Be as accurate as possible.
3. Place the funnel spout into one of your 125 mL. Erlenmeyer flasks. Empty compound A slowly into the flask using the plastic spoon.
4. Repeat step 2 using compound B.
5. Place the funnel spout into the other 125 mL. Erlenmeyer flask. Empty compound B slowly into the flask using the plastic spoon.
6. Observe the color and texture of each compound and record your observations below: **(4 pts.)**

|  |  |  |
| --- | --- | --- |
| **Compound** | **Color** | **Texture** |
| A |  |  |
| B |  |  |

1. Using your plastic pipet, retrieve 5 mL. of vinegar and place in your graduated cylinder.
2. Transfer the vinegar into the Erlenmeyer flask containing compound A using your funnel spout.
3. Repeat step 7 with compound B. Record your observations for each compound below: **(2 pts).**

|  |  |
| --- | --- |
| **Compound** | **Observation** |
| A |  |
| B |  |

What physical and chemical differences between the two compounds did you record? **(1 pt.)**

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How do physical and chemical properties differ? **(1 pt.)**

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Vinegar reacts with baking soda but not with sugar. **(2 pts.)**

What is compound A? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is compound B? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Clean out all lab ware by rinsing out thoroughly with one small drop of soap and water at your using the brushes at your lab sink.
2. Using the attached periodic table, fill in the table below: **(10 pts.)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Element** | **Chemical Symbol** | **Protons** | **Neutrons** | **Electrons** |
| Sodium |  | 11 |  | 11 |
|  | F |  | 10 | 9 |
|  | Al | 13 |  | 13 |
| Neon | Ne | 10 |  | 10 |
| Chlorine |  |  | 18 |  |

1. Identify the maximum number of electrons each shell, or energy level, can hold. **(4 pts.)**

1st energy level: \_\_\_\_\_\_\_\_\_

2nd energy level: \_\_\_\_\_\_\_\_\_

3rd energy level: \_\_\_\_\_\_\_\_\_

4th energy level: \_\_\_\_\_\_\_\_\_

1. Draw the electron shell configurations for the following elements. Indicate the number of protons and neutrons inside the nucleus as well as the valence electrons for each one: **(12 pts.)**

**Nitrogen (N) Silicon (Si) Argon (Ar)**

Valence e-: \_\_\_\_\_\_\_\_\_\_ Valence e-: \_\_\_\_\_\_\_\_\_\_ Valence e-: \_\_\_\_\_\_\_\_\_\_

1. Look at the attached Periodic Table. There are a number of major groups on the Periodic Table with similar properties. They are as follows:

Hydrogen: This element does not match the properties of any other group so it stands alone. It is placed above group 1 but it is not part of that group. It is a very reactive, colorless, odorless gas at room temperature. (1 outer level electron)

Group 1: **Alkali Metals** – These metals are extremely reactive and are never found in nature in their pure form. They are silver colored and shiny. Their density is extremely low so that they are soft enough to be cut with a knife. (1 outer level electron)

Group 2: **Alkaline-Earth Metals** – Slightly less reactive than alkali metals. They are silver colored and more dense than alkali metals (2 outer level electrons).

Groups 3 – 12: **Transition Metals** – These metals have a moderate range of reactivity and a wide range of properties. In general, they are shiny and good conductors of heat and electricity. They also have higher densities and melting points than groups 1 & 2.

**Lanthanides and Actinides**: These are also transition metals that were taken out and placed at the bottom of the table so the table wouldn’t be so wide. The elements in each of these two periods share many properties. The lanthanides are shiny and reactive. The actinides are allradioactive and are therefore unstable. Elements 95 through 103 do not exist in nature but have been manufactured in the lab.

Group 13: **Boron Group** – Contains one metalloid and 4 metals. Reactive, Aluminum is in this group. It is the most abundant metal in the Earth’s crust (3 outer level electrons).

Group 14: **Carbon Group** – Contains one nonmetal, two metalloids, and two metals. Reactivity varies (4 outer level electrons).

Group 15: **Nitrogen Group** – Contains two nonmetals, two metalloids, and one metal. Reactivity varies (5 outer level electrons).

Group 16: **Oxygen Group** – Contains three nonmetals, one metalloid, and one metal. Reactive group (6 outer level electrons).

Group 17: **Halogens** – All nonmetals. Very reactive. Poor conductors of heat and electricity. Tend to form salts with metals. Example is NaCl, sodium chloride, also known as “table salt” (7 outer level electrons).

Group 18: **Noble Gases** – Un-reactive nonmetals. All are colorless, odorless gases at room temperature. All found in earth’s atmosphere in small amounts (8 outer level electrons).

1. Using colored pencils, color each group on the attached Periodic Table as follows: **(13 pts.)**

* Color the square for Hydrogen pink.
* Lightly color all metals yellow.
* Place black dots in the squares of all alkali metals.
* Draw a horizontal line across each box in the group of alkaline earth metals.
* Draw a diagonal line across each box of all transition metals.
* Color the metalloids purple.
* Color the nonmetals orange.
* Draw small brown circles in each box of the halogens.
* Draw checkerboard lines through all the boxes of the noble gases.
* Using a black color, trace the zigzag line that separates the metals from the nonmetals.
* Color all the lanthanides red.
* Color all the actinides green.

When you are finished, make a key that indicates which color identifies which group.

1. Balance the following chemical equations: **(12 pts.)**

\_\_\_ P + \_\_\_ O2  🡪 \_\_\_ P2O3

\_\_\_ C2H4Cl2 + \_\_\_ O2 🡪 \_\_\_CO + \_\_\_ H20 + \_\_\_ Cl2

\_\_\_ Al + \_\_\_ HCl 🡪 \_\_\_ AlCl3 + \_\_\_ H2

**LAB QUESTIONS (1 pt. each) –** *Please write your answers in* ***COMPLETE SENTENCES****!*

1. Describe the three common states of matter.

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1. Define entropy.

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1. What are the 2 most abundant elements in Earth’s crust?

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1. Differentiate between the 3 types of subatomic particles, making sure to indicate their location.

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1. How can you appropriately identify periods and groups on the Periodic Table of Elements?

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1. What is an isotope? Give an example of one.

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1. Define valence electrons and describe their importance.

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1. Differentiate between a compound and a molecule.

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1. What is a diatomic molecule? List the seven that occur naturally.

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1. In a chemical equation, indicate the location of the reactants and the products.

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1. Describe the formation of table salt, including electron interactions.

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1. Differentiate between an ionic bond and a covalent bond.

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1. Describe different types of mixtures.

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**CONCLUSION (5 pts.) –** *Write a solid paragraph (at least 5 sentences) about your conclusions from the lab. Discuss the steps you went through during your lab experiment, what you accomplished, and how you tested your hypothesis. Also include what you learned as a result of this lab experiment.*

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